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1984 Annual Report

United States Department of the Interior
Bureau of Reclamation

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Commissioner's Letter

To: Secretary of the Interior

We are proud to submit our 79th Annual Report on Bureau of Reclamation program accomplishments. This report summarizes our most significant activities during fiscal year 1984 in the planning, development, and operation of water resource projects throughout the 17 Western States and Hawaii.

A special article, entitled "Reclamation Reform Act of 1982 . . . A New Look for an Old Law," is included in this 1984 issue. This article provides an overview of this new law and its impacts on acreage limitation.

As a Nation, we have doubled our consumption of water over the past three decades — but we have not doubled our available water supply. Virtually every water resource expert warns of a coming national water crisis with the potential of being far more devastating than the energy crisis of the 1970's. We, at Reclamation, continue to work actively toward responsible management of our available water supplies and toward developing additional water resources to meet the needs of future generations. This report gives evidence of our accomplishments toward achieving these goals.

R.A. Olson

Robert N. Olson, Acting Commissioner
Bureau of Reclamation

Robert N. Olson

United States Department of the Interior
William P. Clark, Secretary

Bureau of Reclamation
Robert N. Olson, Acting Commissioner

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Preface

This is the 79th Annual Report on Bureau of Reclamation program accomplishments. Its purpose is to provide an overview of the Bureau's role in the Department of the Interior's program for developing and managing our natural resources to meet the present and future requirements of society.

This report summarizes fiscal year 1984 accomplishments in the areas of planning, research, construction, operation and maintenance, foreign activities, and the environmental, cultural, and youth programs.

The Annual Report formerly was published as a summary volume with three statistical appendixes. The appendixes are now a separate report consisting of three volumes entitled "Summary Statistics."

Summary Statistics Vol. I, *Water, Land, and Related Data*, contains data on crops and multipurpose functions such as municipal and industrial water service, power, recreation, and flood control. Vol. II, *Finances and Physical Features*, contains cost and repayment data, the Bureau's "Consolidated Financial Statement," and related historical data. It also contains physical statistics on the various types of dams, canals, powerplants, and related features constructed or operated under Reclamation's program. Vol. III, *Project Data*, presents, on an individual project basis, much of the data summarized in the other volumes.

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Planning

The Bureau of Reclamation planning program is seeking methods to conserve and develop water supplies for the water-short areas of the West and to use existing water supplies as efficiently as possible to improve the standard of living for those who live in the west, as well as to provide products that benefit the entire Nation.

Planning activities are coordinated with State and Federal agencies, local entities, and the public to avoid duplication of effort and to assure that the most beneficial project for the area will be formulated. Seven new plan formulation studies and three new advance planning investigations began in FY 1984; work continued on 46 ongoing studies. Reclamation completed and released 21 planning reports to the Congress and the public in FY 1984. Fifteen of these reports identified or provided specific information on potential projects.

During the year, Reclamation actively pursued non-Federal financial support in its general investigations. As a result, some cost sharing was obtained in FY 1984, with prospects high for substantial non-Federal cost sharing in the future. As part of the public involvement process, States and local entities participate in setting priorities for planning investigations on potential projects.

Planning activities in FY 1984 focused on water conservation, improved water management, power development as part of a multipurpose project, and increasing water supplies for municipal and industrial and irrigation uses.

Although the Central Arizona Project is under construction, planning activities on the Regulatory Storage Division are still underway. Because of considerable opposition to construction of the authorized Orme Dam at the confluence of the Salt and Verde Rivers, studies to consider alternatives to the dam were initiated in 1979. In April 1984, the Secretary of the Interior approved Plan 6 as the preferred alternative. Plan 6 includes New Waddell Dam on the Aqua Fria River, Cliff Dam on the Verde River, and a modified Roosevelt Dam on the Salt River. The Central Arizona Project will provide supplemental irrigation water to about 997,000 acres of irrigated lands and allow for a 640,000 acre-foot annual water supply for future municipal and industrial purposes. Benefits to fish and wildlife, recreation, and flood and sediment control also will be provided by the project.

Phase I of the Yakima River Basin Water Enhancement Project, Washington, includes measures that would increase water availability in the Yakima River Basin. Washington State and the Yakima Indian Nation are cooperating with Reclamation in a comprehensive study which is investigating storage potential and other measures to provide additional water supplies for irrigation development, to enhance streamflow conditions for anadromous fish, and to improve water quality. Fish passage and protective measures were identified at 20 sites that would be effective in permitting the restoration of salmon and steelhead runs. Additional benefits would accrue from the operation of flood control facilities and the development of hydropower. Federal legislation

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(Public Law 98-381, dated August 17, 1984; and Public Law 98-396, dated August 22, 1984) respectively authorize the Secretary of the Interior to design, construct, and operate the fish facility improvements; and to credit the State, the Yakima Indian Nation, and any other entity for costs they bear in constructing the facilities.

On the Bonneville Unit, Central Utah Project, investigations centered on developing resources for the Diamond Fork Power System. The initial plan considered an ultimate power development concept that included facilities for a pumped storage plant. However, after reviewing short- and long-term power needs it was decided to pursue a conventional flow-through power system with the option to provide for conversion to a pumped storage system at a future date. The Diamond Fork Power System is to be constructed using non-Federal financing for the costs separable to power. Project preconstruction activities are underway; however, initiation of construction will be contingent upon obtaining commitments for non-Federal participation.

Several multipurpose projects were investigated in the coastal river basins of the Texas Basin Project, including Bon Wier; Colorado Coastal Plains; Bedias; San Jacinto; and Big Sandy Projects. These investigations will determine the short- and long-term water supply needs of rapidly growing metropolitan areas such as Houston and Galveston, as well as many smaller cities along the coastal plains. The investigations evaluated reregulation of freshwater flow from power releases and floodflows for the benefit of downstream wildlife management areas, and preservation and enhancement of fish and wildlife resources. Other major benefits would include flood control, recreation, and hydroelectric power generation.

Colorado River Water Quality Improvement Program

The CRWQIP (Colorado River Water Quality Improvement Program) investigations are developing a comprehensive and cost-effective program for salinity control in the Colorado River Basin. Salinity standards for the Colorado River, including numeric criteria for the lower mainstem, were established in 1975. Further development of the basin's water resources will cause salinity levels to exceed these numeric criteria unless salinity control measures are implemented. Natural sources contribute the largest share of the salt load; however, return flows from irrigation also make significant contributions. In addition, the normal salt load is concentrated into smaller volumes of water by out-of-basin exports of high-quality water, evapotranspiration by irrigated crops, and evaporation from large reservoir surface areas.

The CRWQIP general investigations program expenditures in FY 1984 were $5.1 million. Plan formulation studies were active on 12 units in the Upper and Lower Colorado Regions, with support and coordination activities provided by

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the Colorado River Water Quality Office staff at the E&R (Engineering and Research) Center in Denver.

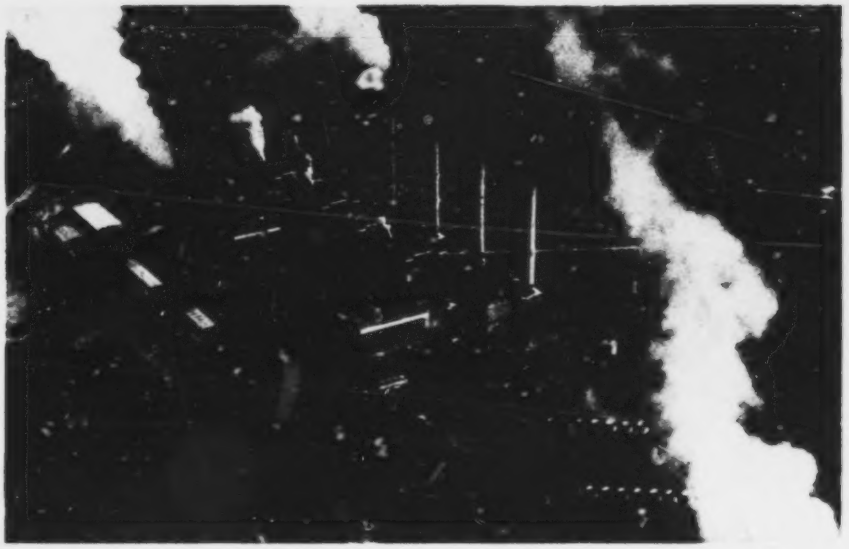
Reclamation's planning report and final environmental statement on the Lower Gunnison Basin Unit in Colorado were filed with the Environmental Protection Agency on February 10, 1984. Stage I features of the unit, including provisions for winter water delivery and canal and lateral lining, are being considered for construction authorization under proposed legislation. Basic data collection on the balance of the Lower Gunnison Unit also is underway.

The recommended plan and environmental assessment for the McElmo Creek Unit, Colorado-Utah, has been completed. Features of the recommended plan, which include combining and lining canals and placing laterals in pipe, are being proposed in new legislation that would authorize the unit to be constructed in concert with the Dolores Project.

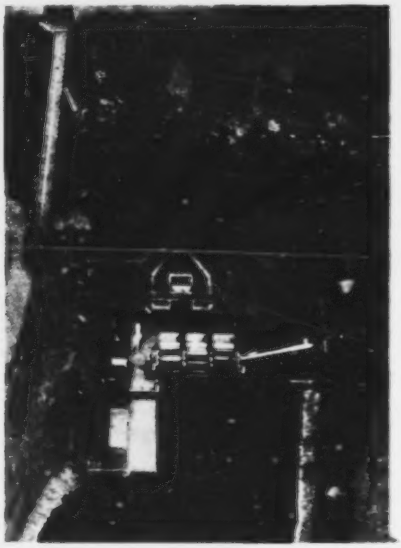
Planning continues on 11 other irrigation and point source units, with special emphasis on selection of cost-effective features and coordination with other ongoing salinity control activities of the Department of Agriculture.

Under the Saline Water Use and Disposal Opportunities Unit, Reclamation awarded contracts to study the technical and economic feasibility of saline water use equipment at the Hunter Powerplant in Utah and the Jim Bridger

Jim Bridger Powerplant near Rock Springs, Wyoming.



Moss and debris removal structure on Government Highline Canal, Grand Valley Unit, Colorado.



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Powerplant in Wyoming. Installation of saline water use equipment at an existing powerplant is being pursued to verify the use of saline water for powerplant cooling and to address the economics of required treatment.

The AQUATRAIN Project is a pioneering effort between Government and private industry to seek solutions to the Colorado River Basin salinity problem and to achieve an economical coal transport method.

Changes in the project configuration came about in FY 1984 as a result of the sale of Aquatrain, Inc. (the private company cooperating in the effort) late in 1983. The firm's new owner — Western Water Reserves, Inc. — commissioned feasibility-level market research, engineering studies, cost estimates, and financial analyses for the liquid carbon dioxide/coal slurry pipeline and subsequently revised the pipeline route in 1984. The proposed coal slurry pipeline, renamed Western Resource Transport, would be 1,180 miles long and would link the vast Powder River Basin coalfields with the port of Long Beach for coal export. The new alignment is a more direct route from coal sources to markets than the previously proposed route.

Reclamation and Aquatrain, Inc. continue to study possible uses for saline water in Wyoming, Colorado, Nevada, and Utah. Preliminary analyses show the potential for diverting saline water before it enters the Colorado River and for carrying it to locations for such uses as powerplant cooling, oil shale recovery, and potash solution mining.

Through an agreement with Reclamation, the Bureau of Land Management identified and evaluated possible corridors for the pipeline. The Forest Service also participated extensively in the study of corridors in National Forests. Reclamation published a February 1984 report recommending a series of corridors and routes for further consideration during environmental impact statement scoping, scheduled to begin in 1985.

Western Resource Transport proposed pipeline route.

In the latter part of the fiscal year, Aquatrain, Inc. began seeking letters of intent from private industry investors to finance the design, construction, and possible operation and maintenance of the AQUATRAIN Project. Commitments from potential pipeline users (supplies and markets) also were pursued.

Although costs for salinity control features are not presently known, the anticipated cost to develop, design, and construct the liquid carbon dioxide/coal slurry line over a 5-year period (1985-89) is $1.2 billion for a system capacity of 10 million tons of coal per year. An additional $121.8 million would be required for the 1993-94 expansion to 15 million tons per year.

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Research

The Bureau of Reclamation's research program is conducted to improve technology in support of its mission of water, land, and power resource development in the West. Research in FY 1984 involved a wide range of projects in Program Related Engineering and Scientific Studies and Atmospheric Resources Research.

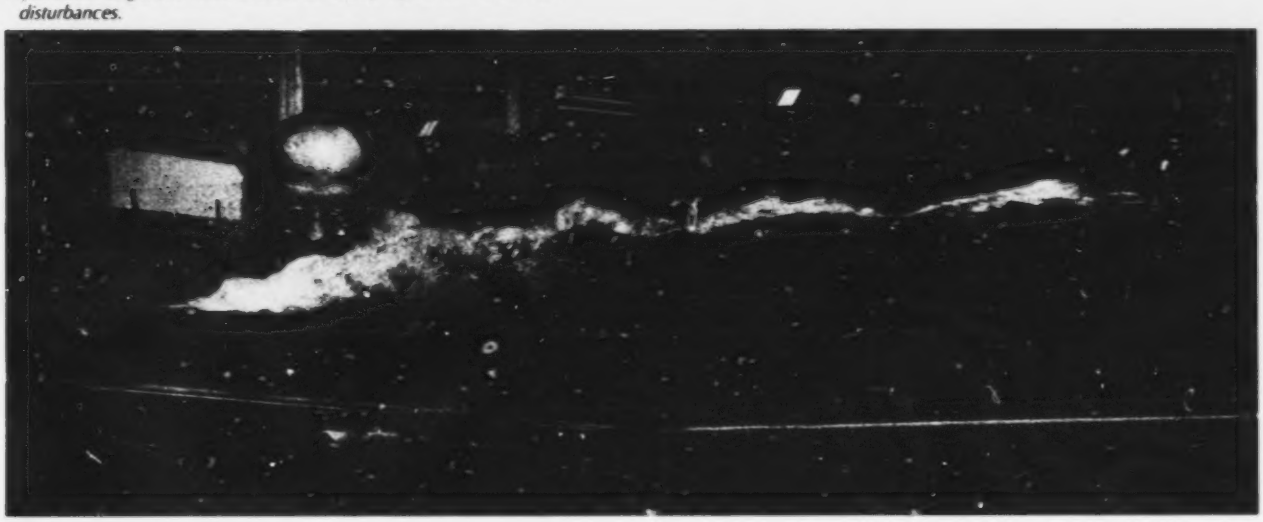
Program Related Engineering and Scientific Studies

The PRESS (Program Related Engineering and Scientific Studies) program directly supports the planning, design, construction, and operation and maintenance of Bureau projects. Research ranges from social, economic, and environmental studies to purely technical studies in engineering and materials. Work is accomplished by a combination of in-house projects and grants, cooperative agreements, and contracts with universities and private firms.

Reclamation's applied research program produces both tangible cost savings and intangible benefits, such as increased safety and longer life for structures and equipment. Results are used by other Government agencies, private enterprise, and other nations. In a typical year, the benefit-cost ratio is estimated at 10 to 1, not including intangible benefits.

The research program constantly changes to meet new problems and opportunities. New projects are selected for funding by a Bureau-wide prioritization process wherein managers, researchers, and users of research

Hydraulic engineer uses model to study open channel flow disturbances.



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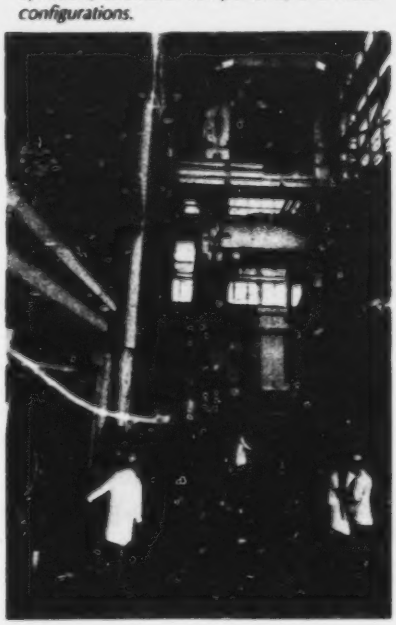
results select highest priority projects to be included in each year's research program. PRESS was funded at $4.8 million in FY 1984. At this level, 105 research projects were underway, with 13 of these completed during the year. Research is divided into several categories: water supply augmentation and conservation, water quality and ecology, planning, engineering and materials, dam safety, and advanced energy applications.

Water Supply Augmentation and Conservation. — Studies in this area identify and develop practical technology for managing and conserving available water supplies. Ongoing research involves improved canal operations, hydrology, river channels, sedimentation, and aquatic plant control. A project on ground-water computer analysis was completed in FY 1984 and resulted in a digital computer model that analyzes the effects of ground-water development projects on large (basinwide) areas.

Water Quality and Ecology. — This major research category develops new and better methods for protecting the quality of water, studies environmental-ecological impacts, and develops methods for mitigation related to Bureau projects in both the planning and operational phases. Representative projects include predictive models for salt concentrations, temperature, and nutrients; herbicide residues; acid rain; data collection and management; limnology and effects of water releases.

Five-million-pound-capacity universal testing machine is used for testing large concrete cylinders, structural components, and metal configurations.



Planning. — Research in this area involves efforts to improve the planning and decisionmaking processes for new projects. Ongoing studies in FY 1984 included multiobjective planning tools and applications and improvement in cost-benefit analyses. A study of evaluation methods was completed, which produced an interactive computer program for evaluating social and public involvement aspects of Reclamation projects.

Engineering and Materials. — Research in this area aims to improve the design of facilities for water storage, control, and conveyance; hydropower and pumping; and electrical generation and transmission. It encompasses studies in materials, construction, hydraulics, operation and maintenance, and instrumentation. In FY 1984, three projects were completed and resulted in a more economical method for designing water tunnels subjected to internal pressure; a determination of the feasibility of controlling draft tube pressure surges by varying generator excitation through a feedback controller; and a more accurate, easy-to-use flowmeter device.

Dam Safety. — This research is conducted to identify critical factors related to dam safety, to identify existing technology, and to develop new technology to assure that existing and planned structures have the highest possible degree of safety. In FY 1984, six projects were completed which resulted in:

- Methods for modifying existing structures and designing new structures that will reduce or eliminate stilling basin damage
- Identification of factors that result in hydraulic fracturing of earth dams

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- A field test method for identifying dispersive soils
- A method for determining the effect of soil liquefaction from earth quakes on the deformations and stability of dams
- An improved predictive capability for determining dynamic properties and cyclic strength of various soil conditions
- An interactive computer program which allows transposition of severe storms to other river basins and computation of their effects

Advanced Energy Applications. — This research is designed to improve the efficiency of state-of-the-art electric power generation and to investigate promising new energy concepts for application to Reclamation projects. A major ongoing cooperative project is a solar pond power generation facility in El Paso, Texas. In FY 1984, construction of the solar pond was nearly completed; installation of the power generator will begin in FY 1985.

Atmospheric Resources Research

The Nation's leading atmospheric research and weather modification program, Project Skywater, concentrates on developing effective cloud seeding technology for water supply augmentation that is compatible with environmental, social, and economic concerns. From the beginning of Project Skywater, the Bureau has enlisted the expertise of the academic community and the private sector and has conducted cooperative investigations with other Federal, State, and local agencies. Research varies from theoretical modeling to field seeding experiments and equipment development. Reclamation also participates in the transfer of technology for augmenting the water supplies of other water-short Nations.

Sierra Cooperative Pilot Project. — Reclamation's SCPP (Sierra Cooperative Pilot Project) is the only major weather modification research program currently operated by the Government. Its ultimate objective is to develop an improved, scientifically based cloud seeding technology for increasing streamflow by augmenting precipitation in the Sierra Nevada. The SCPP field studies are concentrated in the American River Basin and portions of the Tahoe-Truckee Basin in California and Nevada.

Expenditures related to SCPP totaled about $3 million in FY 1984. The work was performed by Government personnel, cooperating agencies, and six contractors. The contractors — 3 universities and 3 private firms — employed about 40 scientific and technical personnel on SCPP tasks.

In FY 1984, SCPP work primarily involved the search for supercooled liquid water (liquid water at temperatures below 0 °C) in winter storms. Storms containing supercooled liquid water generally are considered to offer the best opportunities for increased precipitation by seeding. Devices used in the search for supercooled liquid water included an instrumented aircraft, a microwave radiometer operated near the crest of the Sierra Nevada, and an icing rate

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meter operated on the crest of Squaw Peak at Squaw Valley, California. Some small-scale seeding experiments were carried out to document the conversion of supercooled water to ice crystals by dry ice seeding and the growth of the ice crystals into snowflakes.

Windpower. — Preliminary windpower surveys are part of Reclamation's effort to develop alternate energy sources. In FY 1984, 16 atmospheric research PROBE (Portable Remote Observations of the Environment) stations were operated in remote areas to collect and transmit data on potential windpower generation sites to a receiver located at the E&R Center for computer analysis. This analysis determines the wind energy potential and reliability at the sites.

Helicopter transports a 20-foot meteorological tower to a remote site in California's American River Basin. Photo by T. J. Henderson.

PROBE station records and transmits weather data. Photo by T. J. Henderson.

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Colorado River Augmentation Demonstration Program. — Colorado River Augmentation Demonstration Program activities in FY 1984 involved field operations in the Grand Mesa, Colorado, area. Factfinding and data collection studies were conducted using a variety of atmospheric research equipment including radar, radiometer, satellite imagery, and a cloud physics aircraft provided by the University of North Dakota.

Continuing research and planning studies conducted in this demonstration program have generated the CREST (Colorado River Enhanced Snowpack Test) proposal. During FY 1984, planning activities concentrated on refining estimates of program costs and benefits and conducting preliminary design studies. The CREST proposal advances an 8-year demonstration program to confirm and assess the potential for augmenting Colorado River flows by means of safe and reliable cloud seeding technology.

Benefits to be realized from CREST include producing an estimated 340,000 acre-feet of water annually during the test period. If CREST demonstrates the expected results and operational use of snowpack enhancement is implemented, the annual augmentation potential is projected at 1.4 million acre-feet in the Upper Colorado River Basin, 298,000 acre-feet in the Lower Colorado River Basin, and 533,000 acre-feet in adjacent basins of Colorado, New Mexico, Wyoming, and Utah. The value of this additional water is estimated at $139.4 million in 1983 dollars, calculated on the basis of increased hydroelectric power production, salinity reduction, and additional water supplies. This means that snowpack enhancement technology demonstrated in CREST could produce potential benefits valued at $9-12 for every dollar spent.

Southern Plains Enhanced Rainfall Development Proposal. — The goal of this proposal is to demonstrate a cloud seeding technology for convective clouds over the Southern Plains to augment ground and surface water resources for the benefit of agricultural, municipal, and industrial users. An outgrowth of the Bureau's Southwest Drought Research Program, the project is a cooperative effort between the Bureau of Reclamation, the Oklahoma Water Resources Board, and the Texas Department of Water Resources.

Research began in the spring of 1984 to design cloud seeding demonstration projects. The Texas demonstration project will concentrate on further development of seeding technology; and the Oklahoma project will stress development of rationales for applying the technology and investigation of the economic, social, and environmental impacts of State-sponsored operational seeding projects. Reclamation's role is to provide access to the Environmental Data Network and its programs and data, coordinate activities, and integrate the results into a regional assessment of convective cloud seeding.

Grand Canary Island Precipitation Enhancement Project — During 1984, a report on the 1982-83 rain stimulation project on Grand Canary Island was completed. This was the first report of a 5-year feasibility study. Scientific

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evaluation of the cloud seeding results cannot be made until more clouds are studied, in accordance with the 5-year plan. However, sufficient progress has been made and preliminary findings are sufficiently encouraging to warrant the project being continued to a satisfactory conclusion. U.S. Government support for this project was interrupted in 1983 by the expiration of the Treaty of Friendship and Cooperation between the U.S. and Spain. A proposal to continue the project has been submitted by the Bureau.

Morocco Winter Snowpack Augmentation Project. — The Kingdom of Morocco has been experiencing a prolonged drought and increasing water resources problems. At the request of the Government of Morocco, a team of four American scientists funded by AID (Agency for International Development) visited Morocco. In its assessment report, the team recommended that the highest priority be given to the development and implementation of a scientifically based demonstration program of winter precipitation augmentation in the central High Atlas Mountains in Morocco, with the objective of providing additional water from runoff for hydroelectric power generation, irrigation, and domestic and industrial use.

The Project Grant Agreement between the Kingdom of Morocco and the United States for the Winter Snowpack Augmentation Project was signed in Morocco on April 7, 1984. The Bureau is assisting AID in this project by providing transfer of technology, technical assistance, scientific equipment, and training.

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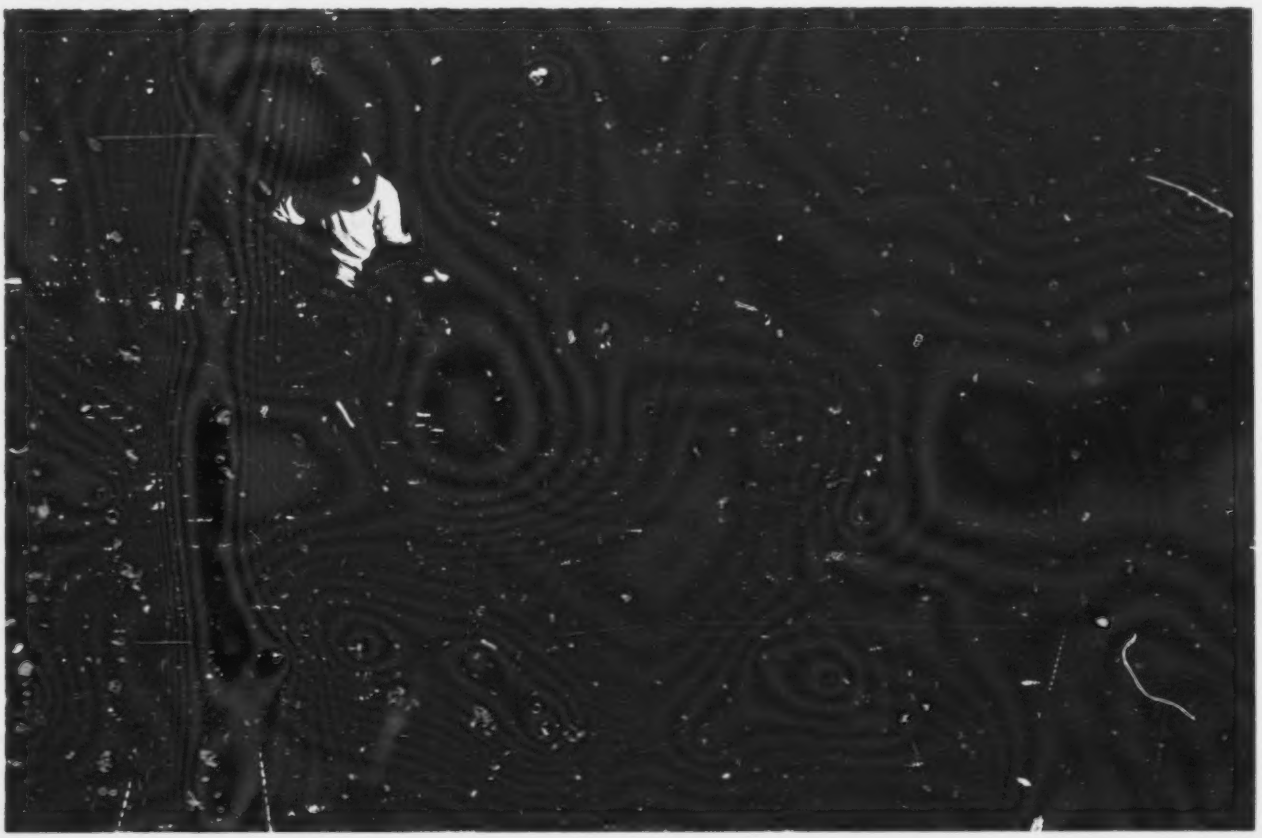
Construction

Under the Bureau of Reclamation construction program, new contracts totaling about $373 million were issued in FY 1984 for all seven regions.

Pacific Northwest Region. — Construction contracts totaling about $33.8 million were underway in the Pacific Northwest Region during FY 1984. Major construction continued on the Columbia Basin and Chief Joseph Dam Projects.

On the Columbia Basin Project, 35 construction contracts — totaling about $10.9 million — were in force as construction continued on the Grand Coulee downstream stabilization program. Six drainage contracts totaling $1.7 million, were completed. The Priest Rapids Wasteway and enlargment of a portion of the West Canal were completed for $2.1 million.

Workman places concrete on Peach 1B of the Salt River Aqueduct, Central Arizona Project.



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On the Chief Joseph Dam Project, Schedules 1 and 2 contracts of the Oroville-Tonasket Unit were completed and work was begun on Schedule 3. Cordel and Crater Lakes Distribution Systems, Schedule 1, was turned over to the water district on July 1. Schedule 2 — Ellisford, East Tonasket and Bonaparte Creek Distribution Systems — was essentially completed at yearend. Schedule 3 was awarded in August for $15 million, and work will begin early in FY 1985 on cofferdams and dewatering necessary for construction of Osoyoos Pumping Plant. Two minor contracts were completed for the Whitestone Coulee Irrigation District.

Minor construction included work on several rehabilitation and betterment programs and Small Reclamation Projects on the Yakima Project. Also, four contracts were awarded on the Boise Project for paving and construction of minimum health facilities.

On the Tualatin Project, Oregon, a contract was awarded for constructing a bypass channel and fishscreen structure at Spring Hill Pumping Plant.

Mid-Pacific Region. — The Mid-Pacific Region awarded $45.8 million in new construction contracts during FY 1984. The work was performed on the Central Valley, Solano, and Orland Projects in California; and on the Klamath Project in Oregon. Fourteen contracts, totaling $1.9 million, were completed during the year.

On the Central Valley Project, San Felipe Division, 2 contracts were awarded: a $24.2-million contract for construction of Santa Clara Conduit, Section 2; and a $12-million contract for construction of Pacheco Conduit, Section 2. Other Central Valley Project new construction consisted of 22 contracts totaling $7.4 million.

Aerial view of construction on the pumping plant at Turnout 9 of the Tehama-Colusa Canal, Central Valley Project, California.

A $857,000 contract was awarded on the Orland Project for Safety of Dams modifications on Stony Gorge Dam.

New contract awards on the Klamath Project totaled $1.4 million. The main contract award was for the Klamath Straits East Unit Subsurface Drainage System.

Lower Colorado Region. — The three major ongoing construction projects in the Lower Colorado Region are the Central Arizona Project, the Robert B. Griffith Water Project, and the CRBSCP (Colorado River Basin Salinity Control Project), Title I. Collectively, these projects provide water for agricultural, and municipal and industrial use. New construction contracts totaling $75 million were awarded during FY 1984.

Approximately $2.4 million in Architect/Engineering contracts were awarded during the year. These contracts included design of the Central Arizona Project Maintenance and Warehouse Facility; review of the Roosevelt Dam design

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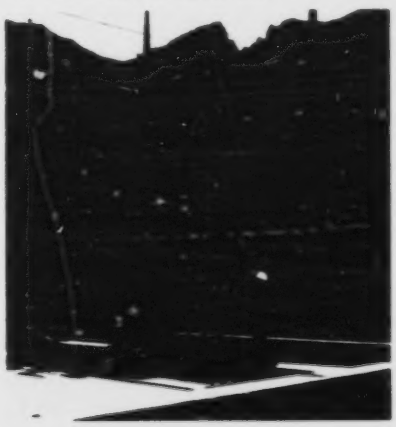
alternatives; gathering of design data for the Hoover Dam spillway repairs and air slot installation; and numerous other contracts for designs, bridge safety analysis, flood damage studies, and environmental mitigation features.

Work continued on contracts associated with the 190-mile-long Granite Reef Aqueduct, with contracts awarded for turnouts, canal lining repair, and a siphon scour control structure on the Salt River. A contract was awarded for ultrasonic flowmeters for Havasu, Bouse Hills, Little Harquahala, Hassayampa, and Salt-Gila Pumping Plants.

Prestressed beams are placed at Meridian Road bridge, Central Arizona Project.

Transformers in switchyard at Havasu Pumping Plant, Central Arizona Project.



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Work continued on the 58-mile Salt-Gila Aqueduct, with contracts awarded for turnouts and Reaches 1-4 Completion. Construction began on Phase A of the Tucson Aqueduct with contracts awarded for Picacho Pumping Plant, Brady Pumping Plant, and Red Rock Pumping Plants.

Work on the Non-Indian Distribution System began with the award of two contracts for canals in the Harquahala Valley Irrigation District.

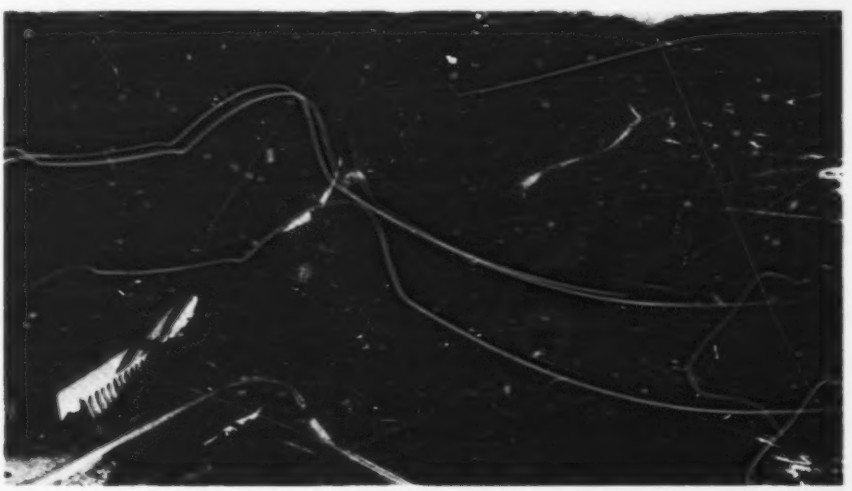
Under CRBSCP, Title I, which will provide water of acceptable quality to the Republic of Mexico, construction work continued on the Yuma Desalting Plant. Contracts were awarded for motor-driven pumping units for a clearwell pumping plant, control block instrumentation, and energy recovery units. On the Las Vegas Wash Unit of CRBSCP, a contract was awarded for construction of the Pittman Bypass pipeline.

Upper Colorado Region. — Construction continued on the Central Utah, Dolores, and Dallas Creek, and Colorado River Basin Salinity Control Projects, along with repairing damage incurred at various structures as a result of the 1983 high water runoff. Little damage was incurred during the 1984 runoff season. Construction expenditures for FY 1984, excluding Glen Canyon spillway repair, totaled $121.8 million. Operation and maintenance funds were used for the Glen Canyon spillway repair.

Construction totaling $57.4 million was accomplished on several features of the Bonneville Unit of the Central Utah Project. Work included the Stillwater

Crew inspects 41 foot-diameter left spillway tunnel at Glen Canyon Dam immediately after spillway test.

Construction continues on Ridgeway Dam, Stage II, Dallas Creek Project. The spillway and right abutment are on the left; embankment is in the center.



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Tunnel completion; the sand and aggregate production for the Upper Stillwater Dam, Tunnel, and Appurtenant Structures; Strawberry Tunnel inlet rehabilitation; Vat Diversion Dam and West Fork Pipeline; Soldier Creek Dam right abutment drainage; Jordan Aqueduct-Reach 4 and Alpine Aqueduct-Reach 3; Strawberry Reservoir clearing; Strawberry Administration Building site development; Strawberry Bay Campground facilities; along with other smaller contracts for drilling, recreational facilities, and road repair.

Contracts awarded on the Bonneville Unit in FY 1984 included the $5.7 million Strawberry Aqueduct North Fork Siphon; the $60.6 million Upper Stillwater Dam; and numerous smaller contracts for recreation facilities, drilling, buildings, and road repair.

Contracts completed or essentially completed during FY 1984 included the Sheep Creek-Rays Valley Road, Soldier Creek Dam left abutment and toe drainage, Utah Projects Office Complex, Currant Creek Road aggregate production, and the Duchesne office complex.

On the Jensen Unit, a $1.9-million contract for Tyzack Aqueduct and Pumping Plant was near completion. A $1.9-million contract for Tyzack Aqueduct-Reach 2 was awarded in August 1984.

Construction totaling about $40 million was completed on the Dolores Project, Colorado. The McPhee Dam was completed and dedicated in August 1984. Work on the Dolores Canal and Tunnel was essentially completed at yearend. Construction of the $5.9 million Great Cut Pumping Plant continued and work on the $2.9-million Anazasi Heritage Center began in May 1984. The Dolores Project also had numerous small projects under construction including a clearing contract, building additions, recreation facilities, and roads

On the Dallas Creek Project, construction totaling $26 million was completed. Progress on the Ridgway Dam included excavation of the dam foundation and final foundation cleanup. By the end of the fiscal year, about 75 percent of this $108.2-million construction project was completed.

Under Title II of the CRBSCP, construction on stage I of the Grand Valley Unit, which is about 10 percent of the project, was completed. Work was being completed toward a contract for the design of injection disposal wells on the Paradox Unit, Colorado.

One of the major problems facing the Upper Colorado Region again this year was the damage done by the high 1983 water runoff. A contract for Flaming Gorge spillway repair below the air slot was awarded in FY 1984. The considerable damage incurred in the spillways at Glen Canyon Dam was repaired and air slots were installed in the spillway tunnels. The estimated cost of this construction was $33 million. It has been determined that an air slot is needed at the Blue Mesa Dam Spillway and a contract was awarded in July 1984.

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Southwest Region. — Ongoing construction, totaling $32.2 million, included work on Brantley, San Luis Valley, McGee Creek, Navajo Indian Irrigation, and Nueces River Projects.

On Brantley Project, New Mexico, relocation of U.S. Highway No. 285 and construction of a field office were completed. Construction of an access road to the damsite was underway and initial reservoir and mitigation land fencing was nearing completion.

Schedule A pipeline lateral and reach A of the main conveyance channel of stage 1-2 at the Closed Basin Division of the San Luis Valley Project, Colorado, were well underway; contracts for schedule B pipeline laterals and reaches B and C of the conveyance channel were awarded and construction began. In stage 3, phase 2 salvage wells were completed. The first phase of aquifer test wells for stage 4-5 were completed, and contracts awarded for the second phase of test wells.

Construction continued on McGee Creek Dam, Oklahoma, with the pumping plant and aqueduct nearly completed at yearend. Work on reservoir access roads and the game warden's residence continued.

On the Navajo Indian Irrigation Project, New Mexico, construction of pipe laterals and pumping plants for Block 6, Stage 1A, progressed. A contract was awarded for installation of electrical switches in the Block 5 distribution system.

The south shores recreation facilities and maintenance buildings were nearing completion on the Nueces River Project, Texas. Contracts for Calliham dike and relocation of crane rail slabs at Choke Canyon Dam were awarded and completed.

Minor construction and rehabilitation work was performed at Palmetto Bend and San Angelo Projects in Texas, Mountain Park and Washita Basin Projects in Oklahoma, and the San Juan-Chama Project in New Mexico.

Service line being installed in South Dakota, WEB Rural Water Development Project.

Upper Missouri Region. — Five major construction contracts, totaling $38.5 million, were underway during FY 1984 on the Garrison Diversion Unit in North Dakota. These included Lonetree Dam, New Rockford Canal, Oakes Pumping Plant, and Oakes Distribution System and Drains.

Under the P-SMBP (Pick-Sloan Missouri Basin Program), rehabilitation and betterment work on the Riverton Unit in Wyoming continued with about $5 million in contracts in force during the year. The Yellowtail Powerplant Emergency Electrical Bypass was completed in FY 1984.

Six construction contracts totaling $17.5 million were underway on the WEB (Walworth, Edmunds, and Brown Counties) Rural Water Development Project in South Dakota. This state project is scheduled for completion in 1989, at a total cost of about $86 million. The Bureau of Reclamation is providing oversite and review to protect Federal financial interests.

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Lower Missouri Region. — New contracts awarded by the Lower Missouri Region for construction and replacement capital equipment totaled $23.5 million in FY 1984. Two projects continued in construction status: the Fryingpan-Arkansas Project in Colorado, and the North Loup Division, P-SMBP, in Nebraska.

Contracts totaling $4.4 million were awarded for construction of Fryingpan-Arkansas Project features, primarily for fish and wildlife facilities.

Just over $2.3 million in contract awards were made for features of the P-SMBP, North Platte, and Kendrick Projects in Wyoming. Major awards on the North Loup Division, P-SMBP, included construction contracts for Mirdan Canal, Sections 2 and 3, Mirdan Open Laterals, and for clearing of the Calamus Reservoir area.

On the Colorado-Big Thompson Project, capital equipment replacement and routine maintenance work accounted for $800,000 in contracts awarded in FY 1984.

Geology

Reclamation geologists provide investigative, advisory, program, and inspection support during all stages of project development. In addition, specialized programs and services in several areas of geologic expertise were provided in 1984.

Geophysical investigation programs, both contract and in-house, were completed on projects in 16 of the 17 Western States in FY 1984. These geophysical programs consisted of refraction, reflection, surface electrical resistivity, self-potential, crosshole shear wave, borehole television, and borehole logging.

Under the Earthquake Hazards Reduction Program, 19 final reports evaluating earthquake hazards with respect to dam locations were completed. These reports involved areas throughout the western 17 states and also in Arkansas. Most of the reports involved Bureau of Reclamation dams; however, several National Park Service and Bureau of Indian Affairs dams were also included. During the year, microseismic networks monitored earthquakes at nine sites in California, Utah, Wyoming, and Colorado. Three of these sites involved joint studies with private firms, state universities, or other Federal agencies.

At the end of 1984, 31 dams, damsites, or major Reclamation project features contained instrumentation to measure the level of earthquake strong motion at the structure sites.

During 1984, the Portadrill drill rig, specially modified for safely drilling in and through embankment dams, was used for dam safety purposes in California, South Dakota, New Mexico, and Montana.

Portadrill is used for controlled drilling through embankment dams.

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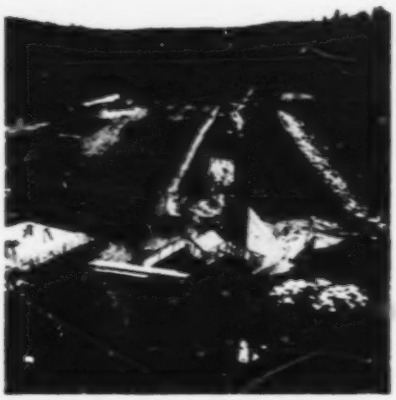
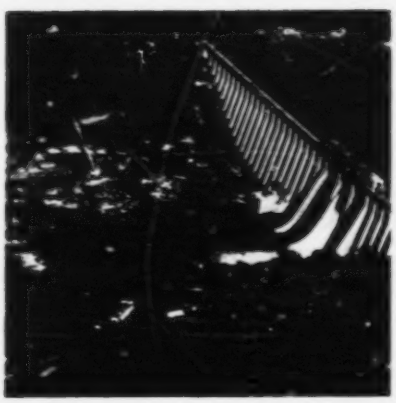
Safety of Dams

The processes for identifying and correcting dam safety deficiencies are established under separate programs. The SOD (Safety of Dams) program is the mechanism for correcting dam safety problems identified under the EES (Examination of Existing Structures) program. A summary of EES activities is included in the Operation and Maintenance chapter of this report.

Authorization for structural modifications to Reclamation dams was provided under the Reclamation Safety of Dams Act of 1978. The Act authorized appropriations not to exceed $100 million for the costs of structural modifications to preserve the safety of Bureau of Reclamation dams. In August 1984, amendments to the Reclamation Safety of Dams Act were enacted. The amendments included increasing the appropriation ceiling an additional $650 million and requiring reimbursement of up to 15 percent of costs incurred, in addition to other revisions.

SOD modifications under construction at Deerfield Dam (top) and Stony Gorge Dam (bottom).





Total costs for SOD activities in FY 1984 were about $16 million. Modifications to raise the dam crest and modify the spillway and outlet works at Deerfield Dam, Rapid Valley Project, South Dakota; and to replace the deteriorated spillway concrete at Guernsey Dam, North Platte Project, Wyoming, were completed during the year. Construction continued at Island Park Dam, Minidoka Project, Idaho, to raise the crest and construct berms; and at Lahontan Dam, Newlands Project, Nevada, to rehabilitate the spillways and outlet works. Also, contracts were awarded to remove and replace low-strength material in the right abutment at Island Park Dam and to add structural modifications to accommodate flood overtopping at Stony Gorge Dam, Orland Project, California.

The modification report for Pactola Dam, Rapid Valley Project, South Dakota, which includes work to raise the dam crest and enlarge the spillway, was approved by Congress in 1984.

Department of the Interior Dam Safety Program. — Reclamation is responsible for assisting other Interior agencies in developing adequate dam safety programs. Program costs in FY 1984 totaled about $700,000 with the following significant program accomplishments:

- Performed 10 initial examinations, 11 reexaminations, and completed 23 SEED (Safety Evaluation of Existing Dams) reports
- Completed advance studies for Dulce Dam, Lake Mescalero Dam, and Black Rock Dam, Bureau of Indian Affairs, New Mexico; Bass Dam and Trout Lake Dam, National Park Service, North Carolina
- Completed final designs for partial modification of Price Lake Dam, National Park Service, North Carolina; and Coolidge Dam, Bureau of Indian Affairs, Arizona
- Continued work on a research project to determine the effects of water overtopping low embankment dams

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- Continued work on contract for inventory, field verification, and hazard classification of dams on Bureau of Land Management administered lands
- Continued development of dams inventory data bases for the Fish and Wildlife Service, Bureau of Land Management, and Bureau of Indian Affairs

Loan Programs

The Reclamation loan programs provide Federal assistance to organizations wishing to construct or improve water resource developments. These programs were made possible by the Small Reclamation Projects Act (Public Law 84-984) and the Distribution System Loans Act (Public Law 84-130). Public Law 84-984 encourages State and local participation in developing water and land resource projects in the West, and Public Law 84-130 enables non-Federal construction of distribution systems on Federal projects. Reclamation's role is to assure the Secretary of the Interior that these projects feasible from a financial and engineering standpoint. As part of this process, Reclamation provides technical assistance to loan applicants and their consulting engineers in planning, constructing, and operating their projects.

During FY 1984, notices of intent to apply for loans were received from 10 districts, representing about $168 million in future loan funds. Forty-six applications for loans were in the preparation stage or under consideration within the Bureau and Department of the Interior.

The Secretary approved five new projects under the Small Reclamation Projects Act in FY 1984, representing about $39.1 million in loan funds. These new projects include Ak-Chin Indian Community and Gila River Farms (Sacaton Ranch), Arizona; Santa Ana Watershed Project Authority, California; East Bench Gravity Company, Montana; and Amity Mutual Irrigaton Company, Colorado.

Representing about $74 million in loan funds, construction began on five new projects: Columbia Irrigation District, Washington; Douglas County, Galesville Project, Oregon; and Oakdale Irrigation District, Colusa County Water District, and Ramona Municipal Water District, all in California. Construction continued on 18 other projects in Arizona, California, Colorado, Montana, Nebraska, and Texas, representing approximately $176 million in total loan amounts for construction.

Garland Canal Power Project, Wyoming, completed its construction program with about $3.3 million in loan funds.

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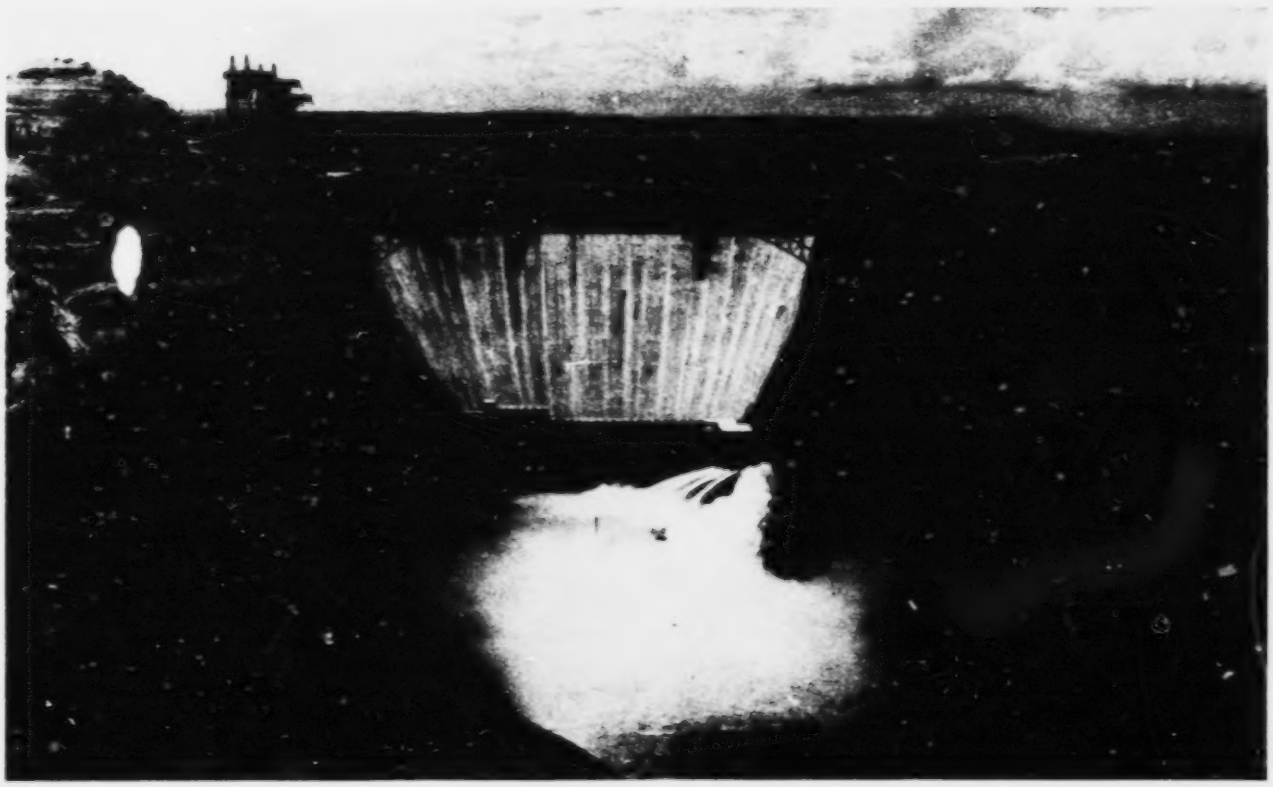
Operation and Maintenance

The O&M (Operation and Maintenance) program is conducted primarily to operate and maintain, on a permanent basis, only power projects and reserve waterworks on multipurpose Bureau of Reclamation projects. The program also involves carrying out associated land and water resource management activities which are designed to assure that such facilities will serve their intended purposes safely and efficiently. All facilities must be operated and maintained in a manner that protects the Federal investment.

Completed water service facilities, except for reserve works, normally are transferred to local water user organizations for operation and maintenance as soon as an organization is able to assume such responsibilities. In FY 1984, 33 ongoing projects and several resource management programs were operated and maintained either entirely by the Bureau or in conjunction with water user organizations.

Glen Canyon Dam left spillway test was held successfully on August 12, 1984, with water releases of 50,000 ft³/s causing no damage.



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Water Operations

Reservoir Operations. — In the winter of 1983-84, above-normal snowpack accumulated in many parts of the West, resulting in high spring runoff which caused flooding problems in many areas. Bureau of Reclamation dams and reservoirs were operated to reduce flooding as much as possible and, as a result of that operation, flooding on streams and rivers controlled by Reclamation projects generally was limited to minimum damage levels.

Colorado River Basin. In 1984, the unregulated April-July inflow to Lake Powell exceeded the record 1983 inflow, with a total runoff of 15.3 million acre-feet. In anticipation of a second wet year, the Bureau had made large releases from the reservoirs late in 1983 and early in 1984, creating extra storage space in the reservoir system prior to the spring 1984 runoff period. That extra space, combined with accurate runoff forecasts, enabled the reservoir system to handle the large volume of runoff without the problems that occurred in 1983.

North Platte River Basin. Spring runoff into Seminoe Reservoir was nearly 200 percent of normal and filled the North Platte reservoir system to capacity in 1984. In anticipation of above-normal runoff, the Bureau worked with involved water user entities and States to increase releases from the system in early 1984, creating extra storage space. Pathfinder Reservoir filled and spilled, causing minor lowland flooding near Casper, Wyoming.

Upper Missouri River Basin. Record inflows occurred in 1984 at Clark Canyon Reservoir on the Beaverhead River near Dillon, Montana, and at Canyon Ferry Reservoir on the Missouri River near Helena, Montana. Spring inflow into Clark Canyon was 350 percent of normal, filling the reservoir to capacity and causing it to spill for the first time. Canyon Ferry Reservoir storage remained in the exclusive flood control pool from June 20 through August 4 in an effort to control the third highest spring runoff of record.

Snake River Basin. Spring runoff in the Snake River Basin ranged from near normal up to 300 percent of normal, resulting in high flows on all streams and record flows on the Henry's Fork of the Snake River. American Falls Reservoir filled and spilled, but releases did not significantly exceed downstream channel capacity.

Review of Operation and Maintenance. — Under the Bureau-wide Review of Operation and Maintenance program, technical specialists examined 122 major structures and 87 carriage and distribution systems in FY 1984. These examinations were performed to determine and document the general condition and level of maintenance being performed on storage dams, diversion dams, tunnels, canals, pumping plants, powerplants, pipelines, and other structures on Reclamation projects. Most of these facilities are operated and maintained by water user organizations under contract with the Bureau. Since title to these facilities remains with the Government, scheduled examinations under this program are necessary to enable the Bureau to fulfill its

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obligation of protecting the Federal investment. Deficiencies in operation and/or maintenance are documented and pursued until corrective measures are implemented.

Water Systems Automation. — The Water Systems Automation program is responsible for developing analytical techniques, automatic and remote control equipment, improved structure designs, and criteria for operation of water resource systems. The final product is the application of program results to projects in planning, design, and operating stages of development.

Computer programs have been written to simulate unsteady flow in canals and to control hydraulic transients through proper regulation of control structures. These programs are used to determine appropriate control methods on several canals. Gate controllers featuring microprocessor units have been assembled to demonstrate state-of-the-art control technology to canal operators at several locations and a study was completed in 1984 on using radial gates for flow measurement. This method of flow measurement may eliminate the need for expensive flow measurement devices at many locations.

Rehabilitation and Betterment. — The R&B (Rehabilitation and Betterment) program, as authorized by the Rehabilitation and Betterment Act of 1949 and by special legislation, is administered by the Secretary of the Interior through the Bureau of Reclamation to facilitate the R&B of irrigation systems on projects governed by Federal Reclamation law and projects constructed under the Small Reclamation Projects Act. Federal funds are loaned to water user organizations for the repair, replacement, or improvement of irrigation structures and systems which have become obsolete or deteriorated to the extent that improvement costs are more than can be funded by the water user organizations.

Benefits that can be derived from an R&B program include better use of the project water supply, improved water distribution through modern control structures and measuring devices, reduction in frequent and expensive maintenance, improved safety for operating personnel and the public, and environmental enhancement.

Since inception of the program, 108 R&B programs have been approved. Three of these programs were approved in 1984 and 8 additional R&B program reports are under consideration.

Water Management and Conservation. — The WMC (Water Management and Conservaton) program was developed as a nonstructural means to promote improvements in project and on-farm water systems and management practices. Authority to conduct the WMC program is contained in the general provisions of the Reclamation law which authorized the Secretary of the Interior to plan, construct, and operate works for the storage, diversion, and development of water in the 17 Western States and Hawaii. The WMC

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program is concerned with the privately owned lands served by the Reclamation projects.

In addition to reducing water use and losses, program objectives include energy conservation and the protection and enhancement of water quality. Considerable emphasis is placed on water measurement and accounting, evaluation of irrigation efficiencies, and evaluation of the program itself. Intensive use of recent state-of-the-art development in minicomputers and associated software is made in implementing these objectives.

The program covers three general types of activities:

- Developing or adapting new technologies for efficient use of water and energy, and protection of water quality in irrigation operations
- Promoting the use of improved technology and management practices by water users
- Providing technical services and assistance to water user organizations and to allied Reclamation programs

The Bureau has a staff of trained technicians and management support personel available in all seven regions and in a number of project offices to assist districts in developing water management programs. During the 1984 irrigation season, 30 districts were cooperating, jointly developing, or operating irrigation scheduling and WMC programs with assistance from the Bureau.

A prime objective of these cooperative programs is to establish "system scheduling" techniques which incorporate on-farm water management (irrigation scheduling) with the operation of the distribution system. The Bureau has increased system scheduling activities within a number of these districts and plans to demonstrate to others that scheduling on-farm demands with distribution system operation is an integral part of the WMC Program. More than 75,000 acres are involved in the regions using system scheduling programs. An irrigation guide service, which provides the daily evapotranspiration rate for the major crops grown in an area, is being used on more than 1.8 million acres, with over 80,000 acres receiving a detailed field-by-field irrigation schedule.

Pest and Hazardous Materials Management. — Pest and hazardous materials activities under the O&M program directly serve and benefit Reclamation projects by providing effective, economical, and environmentally acceptable pest and hazardous materials management programs. These activities include developing new technology for pest management and providing practical, on-the-job assistance to Reclamation offices and cooperating water users. The pest and hazardous materials management program includes the management of aquatic weeds, aquatic invertebrates, terrestrial weeds, insects, rodents and other vertebrates, and pathogens.

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The cooperative research group at the E&R Center assists in the development of improved management techniques through practical research and development activities. In FY 1984 these activities included:

- Hydrilla and eurasian watermilfoil studies
- Continued effort to amend 2,4-D registration for use on eurasian waterilfoil
- Completion of the copper base antifouling coating registration effort for 2,4-D use on water conveyance structures
- Soil residual herbicide studies
- Herbivorous fish studies
- Environmental monitoring studies
- Screening and evaluation of several aquatic and terrestrial herbicides
- Aquatic herbicide controlled-release studies
- Spikerush aquatic weed competition studies

Proposed uses of pesticides are evaluated annually by assigned O&M personnel for effectiveness, economy and efficiency, legality, and environmental acceptability. Certain more critical pesticide proposals are evaluated by Interior's Pesticide Review Work Group.

The *Herbicide Manual*, a practical, illustrated reference and training aid, was published in 1984 for distribution to water user organizations and other public and private groups across the United States, as well as several foreign countries.

Coordination and followup activities were also conducted on the monitoring and control of polychlorinated biphenyls in electrical equipment, in accordance with regulations of the Federal Toxic Substances Control Act.

Hydrilla—an aquatic weed which infests canals and reservoirs.

Project Operations and Maintenance Management System. — POMMS (Project Operations and Maintenance Management System) is a computerized work management and cost reporting system developed to enhance the management decisionmaking process. It is an effective management tool which helps maximize the use of the Bureau's personnel and monetary resources for O&M functions. Work management processes, including authorizing/approving, defining, planning, estimating, scheduling, and documenting various administrative, operation and maintenance, and special programed work activities, are an integral part of POMMS work order system.

Report data are available for reference in coordinating and analyzing work activities in major categories of power and water activities. Historical labor hour and costs, material and support costs, and performance data are accumulated for use in forecasting budgets, justifying equipment upgrade and replacement, and establishing benchmarks.

Since its inception in 1979, POMMS has been installed or initiated in 20 power field offices and 2 irrigation field offices, with twelve of these installations initiated in FY 1984. Installation is planned in eight additional power facilities, which will complete the power facility installations.

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Examination of Existing Structures

The EES (Examination of Existing Structures) activities involve several programs: SEED (Safety Evaluation of Existing Dams); Earthquake Instrumentation; and Operation of Structures.

The SEED program involves the examination and analysis of dams to determine if dam safety deficiencies exist. Dams receive an onsite state-of-the-art review about every 6 years and an onsite reexamination about every 3 years. Based on recommendations resulting from the examination process, the dams are analyzed for hydrologic, hydraulic, seismic, geologic, geotechnical, and/or other considerations. A SEED report presents the examination findings, recommendations, and an overall dam safety classification. If necessary, field investigations are conducted and instrumentation is installed to further determine if a dam safety deficiency exists.

In FY 1984, reexaminations of 76 Reclamation dams were performed and final SEED reports were issued for 19 dams. In addition, the SEED program provided funding for instrumentation, field investigations, and the subsequent analyses required to resolve dam safety issues outstanding from the SEED reports on over 50 dams. Total SEED program costs in FY 1984 were about $5.2 million.

A week-long seminar entitled "Safety Evaluation of Existing Dams" was held in early FY 1984. The seminar, conducted in Washington, D.C. for staffs of the World Bank and AID (Agency for International Development), was devoted to all aspects of dam safety evaluation, including geology; hydrology; seismicity; seepage; design criteria and methods; construction; operation; instrumentation; performance; and onsite examinations.

Under the Earthquake Instrumentation Program, data are collected regularly from approximately 300 dams, maintained in up-to-date computer files, and periodically reviewed to ensure that no unusual patterns are developing. Comprehensive reports were prepared for 64 dams in FY 1984.

A concerted effort is underway to modernize methods and equipment used to obtain and process instrumentation data from dams. Five major concrete dams have been equipped with systems capable of automatically gathering, storing, and transmitting instrument readings. On smaller dams, where total automation is not economically justified, hand-held electronic data gathering devices are being used to record, store, and transmit information to a central computer. A third phase of the automation effort is being directed toward potential landslides around reservoirs. Several areas near Morrow Point and Crystal Dams, Colorado, have been instrumented with devices sensitive to any movement. Data are sent via solar-powered radio transmission to a control center where alarms will sound if excessive movement occurs.

The Operation of Structures program involves the review of operating instructions, preparation of an annual landslide register, and preparation of

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inundation maps. Expenditures during FY 1984 totaled $254,000, of which $228,000 were used to prepare inundation maps for water user-operated dams. Approximately 10 percent of the inundation studies on all Reclamation dams were completed during 1984, bringing the total of completed studies to 70 percent. Completion of inundation studies for water user-operated dams is scheduled for FY 1985, with all other studies to be completed in FY 1986.

Acreage Limitation

On October 12, 1982, President Reagan signed the RRA (Reclamation Reform Act of 1982), which marked the first major change in the acreage limitation provisions of Reclamation law since 1926. Certain provisions of the act — the nondiscretionary provisions — apply to all water districts governed by Reclamation law. The remaining provisions — the discretionary provisions — apply only to those water districts that enter into specific types of contracts with the United States after the date of enactment of the RRA or amend their existing contracts to conform to these provisions.

The discretionary provisions introduce a new concept to Reclamation law. By becoming subject to the discretionary provisions, a qualified recipient (an individual, family, or legal entity benefiting 25 persons or less) may increase its ownership entitlement from 160 acres to 960 acres; a limited recipient (a legal entity benefiting more than 25 persons) may increase its entitlement from 160 acres to 640 acres. Under the discretionary provisions, there is no limit to the amount of land that a qualified or limited recipient may lease; however, there is a limit to the amount of land which can receive low-cost irrigation water from a Reclamation project. A qualified recipient must pay full cost for irrigation water delivered to all leased land that exceeds 960 acres. A limited recipient must pay full cost for water delivered to land in excess of 320 acres if project water was received prior to October 1, 1981. If water was not received before that date, a limited recipient's total landholding is subject to full cost.

Field of parsley being irrigated on the Lower Rio Grande Rehabilitation Project, Texas.

Of those irrigation districts subject to acreage limitation, 141 districts presently are subject to all provisions of the RRA, while 233 districts remain under prior law and are subject only to the nondiscretionary provisions.

In the year after the RRA was signed into law, Reclamation developed rules and regulations to provide uniform criteria and procedures by which the law would be implemented. The final rules were published in the Federal Register on December 6, 1983, and became effective on January 5, 1984.

Full-cost rates for landholders subject to the discretionary provisions are based on several factors, including irrigation-allocated construction costs, interest rates, and contract amortization periods. Since these factors vary with the repayment or water service contract, every water district has a distinct full-cost

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rate. Reclamation has completed preliminary full-cost calculations for all water districts subject to acreage limitation.

Whether subject to the discretionary provisions or prior law, landowners and lessees must show that they are in compliance with the ownership and leasing requirements of law by providing their water districts with facts about their farming operations. For this reason, Reclamation designed certification forms for landholders subject to the discretionary provisions and reporting forms for those subject to prior law. Since this is the first time landholders have been required to provide such information, Reclamation held training sessions to assist them in completing their forms by November 1, 1984. Water districts will summarize information from the landholders' forms and submit their findings to the Bureau by December 1, 1984.

The RRA does exempt certain land from either some or all of the provisions of the law. When a district repays the construction cost allocation for project facilities, its land becomes exempt from acreage limitation and full-cost pricing. The land in 61 water districts has been recommended for repayment exemption. The RRA also exempts lands which receive an agricultural water supply from certain COE (Corps of Engineers) projects. Pursuant to this provision, the Commissioner has notified 325 COE contracting entities that they are exempt from all provisions of Reclamation law.

Section 203(b) of the RRA, commonly known as the "hammer clause," mandates that as of April 12, 1987, landholders who remain under prior law must pay full cost for irrigation water supplied to leased land in excess of 160 acres. Because the Department is concerned about the effects this clause has on past contract commitments and on the financing abilities of some water districts, it has proposed legislation to repeal the provision.

Land Resources Management

The first stages of a computer-based system designed to assist in the storage and retrieval of land use inventory information and enhance Reclamation's ability to meet its accountability responsibilities for the real property it manages was implemented in 1984. This system will provide a uniform source for complete and current information on the extent, management, and use of Federally owned real property from which accurate reports can be generated as required by the Congress and other Government agencies.

Many land management program goals were reached in 1984. Totals of 1,639 acres of fee acquired land and 1,048,051 acres of withdrawn land were disposed of either directly or by reporting them to the Bureau of Land Management or to the General Services Administration for disposal. Also, 224 trespass cases were resolved; 585,422 acres were inventoried; and 1,809,281 acres of withdrawn land were reviewed under the Withdrawal Review Program.

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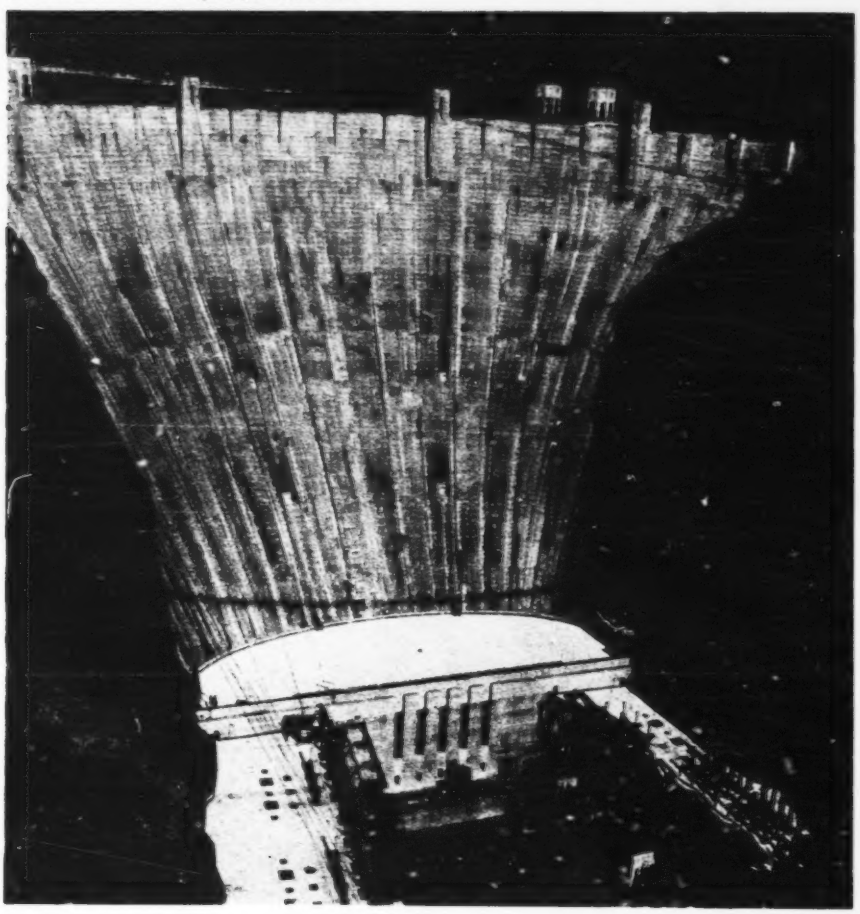
Power Operation and Maintenance

Fiscal year 1984 was a year of change for Reclamation's power program. In order to better respond to the many demands from the electric utility business community and to provide strong power program leadership, a Division of Power was created in the Commissioner's Office. This new power organization aims at enhancing Reclamation's capability to deal with public policy initiatives related to power, developing coherent power program policies, maximizing the returns on the Federal power investment, and improving the reliability and productivity of energy producing facilities.

Hoover Dam and Powerplant, Nevada side.



Switchyard at Grand Coulee Dam and Powerplant.

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The power O&M program is dedicated to protecting the Federal investment in power and major pumping facilitis, improving the efficiency and operation of these facilities, and enhancing the productivity of renewable resources.

Reclamation powerplants, the majority of which have been in service for 30 or more years, now require major replacement of generating equipment components. During this process the operating capabilities of powerplants are being reviewed and generating capacities uprated to better meet present and future power needs. The uprating program in FY 1984 increased generating capacity by 122,500 kilowatts.

The Hoover Powerplant Act of 1984 was signed by the President on August 17, 1984, finalizing an historic three-state agreement on the marketing of Hoover power after the current contracts terminate in 1987. The Act also requires that the Hoover Uprating Program be undertaken with funds advanced by the non-Federal purchasers of Hoover power.

The Grand Coulee Third Powerplant was again at full capability after replacement of the 500,000-volt cables that were destroyed by fire in July 1981.

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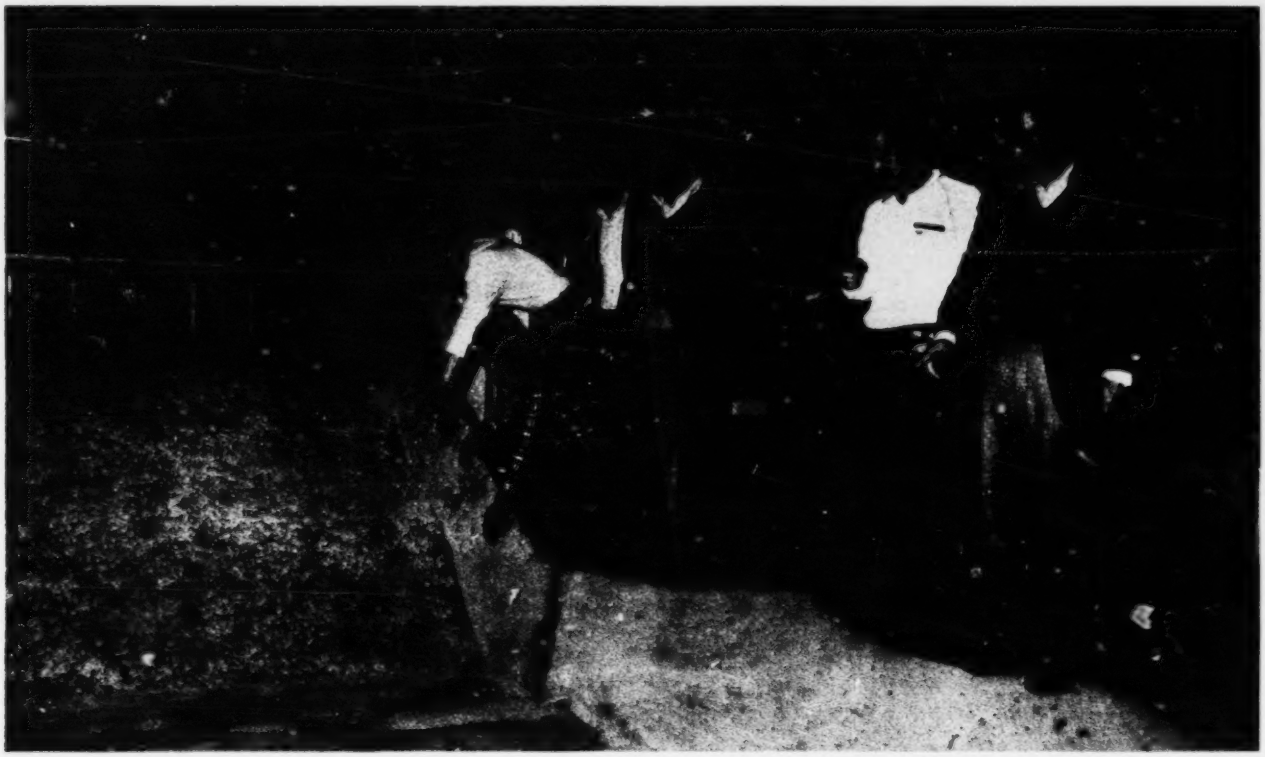
Foreign Activities

The Bureau of Reclamation's foreign activities program continued to expand during FY 1984 with the addition of major new projects to the People's Republic of China and in Pakistan. Training in the U.S. continued at about the same level as in past years, but the number of short term visitors decreased dramatically — from an average of about 350 to only 150.

Technical Assistance. — Reclamation continued to provide both long- and short-term technical assistance to foreign countries under the financial auspices of AID (U.S. Agency for International Development), World Bank, United Nations, and foreign governments.

Reclamation signed a 5-year agreement with the Government of China to assist in the development of the Three Gorge Project on the Yangtze River. Assistance will be provided in the planning, design, construction, and initial operation and maintenance of the project. Three Gorge Project is a

Engineers from Korea study a model in the E&R Center research laboratories.



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multipurpose project including power generation, flood control, and navigation. The principal structures will include a gravity dam having a maximum height of 165 meters, 2 powerhouses having a total installed capacity of 13,000 MW, and a 2-route, 4-stage navigation lock system.

Reclamation signed an agreement with the Brazilian Agency Departamento Nacional de Obras de Saneamento to review the prefeasibility data for the Sao Francisco Diversion Project. The report was completed and forwarded to the Government of Brazil in FY 1984.

Reclamation signed a PASA (Participating Agencies Service Agreement) with AID on January 16, 1984, to provide the services of a civil engineer in Guayaquil. Under the agreement, Reclamation is helping to develop sound technical, administrative, and fiscal procedures for the reconstruction and/or repair of washed-out levees, dikes, and open drainage systems; and the rechanneling of rivers following the destructive high floods of 1983.

Reclamation continued to provide technical advice to the Egyptian Electrical Authority on replacement of turbines for the Aswan High Dam. Installation of the turbines will begin in February 1985. The project is scheduled to be completed in 1990.

In June of 1984, Reclamation and the Government of Israel signed two agreements. Under one agreement for technical assistance, Reclamation will provide advisory assistance on an as-needed basis for specific technical projects. All costs for this assistance will be fully reimbursed to Reclamation. The second agreement is a cooperative science and technology agreement which calls for the mutual exchange of technology in specified areas.

Reclamation's involvement in the Kuala Lumpur Flood Mitigation Project, which began in 1975, continued in FY 1984. The Bureau is providing advisory assistance for construction of Batu Dam. Reclamation has three on-site advisors and also will provide expert consultation services, as necessary, through completion of this project.

Reclamation and the Water and Power Development Authority of Pakistan signed an agreement in FY 1984 under which Reclamation will provide assistance for the Fourth Drainage Project in the Faisalabad section of the Punjab Province. Reclamation will assist with designs and tender documents for subsurface drainage schemes, construction supervision, operation and maintenance strategies, and soil and land classification investigations. Under a second PASA with AID, Reclamation is conducting a training program in Alluvial Channel Hydraulics Design.

Under the U.S.-Saudi Arabia Joint Economic Commission, Reclamation has a Memorandum of Understanding with the Saline Water Conversion Corporation to provide assistance in establishing a Research, Development and Training Center at Al Jubail. The Bureau currently has four persons stationed in Riyadh

Technical experts on cooperative exchange from the People's Republic of China discuss design drawings with Reclamation engineers.

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for this project and a technical coordinator in Denver. Also under this Commission, Reclamation is providing technical advisory assistance to the Ministry of Agriculture and Water. Recent reductions in the Saudi budget reduced the Bureau's staff from 12 to 3.

Under an agreement with the Government of Sudan, Reclamation is conducting a 6-month review of irrigation projects along the Blue and White Nile Rivers. Based on the priorities established by this review, the World Bank will define a 10-year investment program for rehabilitation and modernization of these projects. Reclamation has five employees — working in both Sudan and the United States — involved in this project.

Under an AID PASA, the Bureau is conducting a reconnaissance-level water and land study for the Juba and Lower Shebelli Valleys of Somalia. A team of five will be assigned to investigate the water resources and prepare the master plan for land development.

Under an agreement with the Government of Zaire, Reclamation continued to furnish technical assistance in the operation and maintenance of the Inga-Shaba powerline, a 1700-kilometer, extra-high-voltage, direct-current transmission line. Reclamation has one resident advisor in Kinshasa.

Training and Visitors. — More than 150 official visitors visited the E&R Center in Denver and Bureau field offices during FY 1984. Another 50 engineers, scientists, and administrators — representing 25 countries — completed technical exchange programs tailored to their needs.

An "International Seminar on Water Systems Management Techniques" was presented for 19 engineers from 8 countries in 1984. During the first week, numerous staff, university, and other Government agency specialists presented lectures to the attendees in Denver. Two weeks were spent studying Reclamation projects and water districts located in Arizona and California.

Twelve senior technical experts, representing various offices of the Ministry of Water Resources and Electric Power of the People's Republic of China, arrived at the E&R Center for 1-year technical exchange programs under Annex II of the Hydroelectric Protocol.

Science and Technology. — The U.S.-Spanish Joint Committee approved a new 5-year cooperative program between the Bureau of Reclamation and Director General of Hydraulic Works entitled "Water Resource Management." The program includes 10 separate projects grouped into 3 basic areas — operation and maintenance, hydraulic research, and water quality. Funding in the amount of $2.5 million was approved to carry out activities for the various projects.

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Environmental, Cultural, and Youth Programs

Environmental Enhancement

In the Pacific Northwest, a precedent-setting project to restore salmon and steelhead in the Yakima River in Washington was underway in FY 1984. About 20 dams and diversions will be laddered and screened with over 40 structures. The ultimate plan also includes upstream storage for fish flows. It is estimated that these actions will increase returning adult fish from the present 2,000 to about 80,000 annually. This project is unique in that four entities are funding the project — Bureau of Reclamation, State of Washington, Bureau of Indian Affairs, and Bonneville Power Administration. A similar project is underway on the Umatilla River in Oregon.

Sportsmen and wildlife share recreational facilities at Lake Natoma, formed by Nimbus Dam in California.

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Eight osprey nesting platforms were erected on the west side of Cascade Reservoir, Idaho, in the spring of 1984. Seven bald eagle perching poles were being built at the Grand Coulee Dam afterbay, and more are planned downstream as soon as a bank stabilization project is completed.

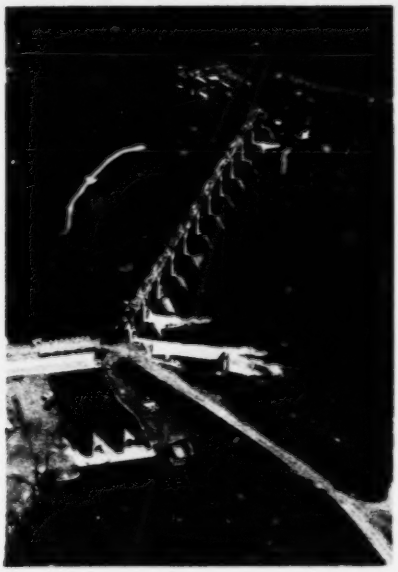
On the Central Valley Project, the lower 1,000 feet of two single-purpose spawning channels were converted to rearing ponds at the Coleman National Fish Hatchery, south of Anderson Reservoir. This will allow the placement of 600,000 smolt-size salmon in a controlled environment until they reach yearling size (10 pounds). Larger size fish have a higher escapement ratio, thus permitting their return to the Sacramento River system for procreation.

A third fishway was added in the center of Red Bluff Diversion Dam, giving the upstream migrating adult salmon a greater opportunity to pass the obstruction caused by the dam. This addition will eliminate the "stacking of fish" that has been occurring below the dam in recent years.

The Bureau of Reclamation continued cooperative efforts with several other agencies to study the endangered bald eagle in central Arizona. Efforts involve a volunteer nest watch program as well as studies of nesting success and productivity of the restricted Arizona population of this species.

As part of the mitigation for the Colorado River Basin Salinity Control Project, land was purchased and transferred to the U.S. Fish and Wildlife Service for inclusion in the Salton Sea National Wildlife Refuge. Efforts are underway to purchase land in the San Sebastian Marsh area to complete our mitigation obligation in California. In Arizona, mitigation efforts centered on designing a master plan for wildlife development at Mumme Farm.

A third fishway was added in the center of Red Bluff Diversion Dam, Central Valley Project.



Reclamation participated in a 2-year biological survey of the Middle Rio Grande, New Mexico, conducted by the Corps of Engineers. The survey, completed in FY 1984, provided a comprehensive inventory of vegetation and wildlife occurring along the Rio Grande in the vicinity of Albuquerque and monitored vegetative succession within an artifically created wetland.

The Bureau of Reclamation, Oklahoma Department of Wildlife Conservation, Oklahoma Tourism and Recreation Department, and U.S. Fish and Wildlife Service conducted a survey and mapped the occurrence of a proposed threatened plant — the long-haired Phlox — on the W. C. Austin Project.

Tiber Reservoir lands in Montana are under intensive management. A management committee made up of State, Federal, and local people was formed to make recommendations about land management issues and problems. Recommendations have included fencing, vegetative seeding, livestock water lanes, and stocking rates. Implementation of the committeee's recommendations have been successful in improving the general vegetative cover and range conditions of the area.

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Studies by the Montana Department of Fish, Wildlife, and Parks indicate that wildlife populations in the Tiber area have also increased. Because of the improved vegetation and subsequent increased rodent populations, the number of raptors has increased. Eagle nests were not active prior to 1980. In 1981 eagle nesting became apparent and, in 1983, three nests produced two fledglings each. Mule deer numbered about 30 head in 1975 and now number over 1,000. Although deer numbers have increased markedly all over the State, rates of increase in the Tiber area are double that of any other area. These wildlife population increases strongly indicate that the land management efforts were effective.

A sandhill crane roosting habitat model was developed for the Platte River in Nebraska, using a combination of low-altitude aerial photography and the Instream Flow Incremental Methodology. Additional data are being collected to apply and further refine the model, which is to be used in conjunction with an existing model to define mitigation measures that may be required for projects in the Platte River Basin.

Cultural Resources

The protection of cultural resources continued to be a vital part of Reclamation's program in 1984.

Reclamation and the National Park Service signed an Interagency Agreement to meet the mandates of cultural resource compliance legislation and regulations for the proposed Jackson Lake Safety of Dams Project. Cooperation between the agencies ensures that adequate survey, site evaluation, and mitigation — if necessary — are completed. In addition, Reclamation will provide funds for patrols to control unlawful artifact collecting at known sites.

Excavations and reports on a Paleoindian archeologic site located on the shore of Rye Patch Reservoir, Nevada, were completed in FY 1984. The site is thought to have been occupied 9,000 to 10,000 years ago. While the remains are sparse, the site is the only known open riverine site in the Great Basin with buried remains of this time period. The site is to be included in the Rye Patch Archeologic District on the National Register of Historic Places.

An interpretative booklet was completed on the history and archeology of Melones, a Gold rush settlement in the Sierra Nevada foothills of California. This publication provides the public with a glimpse of life in the once-thriving community that now rests beneath the waters of New Melones Lake.

The CAP (Central Arizona Project) will supply Indian and non-Indian irrigation districts and municipalities with water from the Colorado River. The water will be conveyed in a series of aqueducts stretching almost 400 miles across

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Arizona. Extensive excavation and data recovery programs are underway on a number of archeological sites that will be affected by construction of the CAP Salt-Gila and Tucson Aqueducts.

Most of these sites are related to the Hohokam culture, a highly organized agriculturally based people who lived in the Phoenix and Tucson Basins from about the beginning of the Christian Era until approximately 1450 A.D. A small number of "archaic" period sites are also being studied. These represent occupation by a hunting and gathering based culture that predates the Hohokam.

Since the completion of fieldwork in 1983, efforts on the Dolores Archeological Program, Colorado, have involved the writing and publishing of reports on the project. To date, 2 volumes of a 12-volume series have been published.

Two intergovernmental agreements with the New Mexico Historic Preservation Bureau provided for reconnaissance-level cultural resource surveys on the stretch of the Rio Grande which includes Elephant Butte and Caballo Reservoirs. Recommendations for nominations of prehistoric and historic sites, as well as suggested methods for preserving and protecting them, were included.

In 1984, a 5-year program of archeological fieldwork was concluded for the San Luis Valley Project, Closed Basin Division, Colorado. The work involved 20,000 acres of survey, test excavation, and systematic collection. General analysis, report preparation, and small-scale surveys to accommodate final design changes will continue through FY 1985.

In Oklahoma, archeological and historical investigations on the McGee Creek Project were initiated by North Texas State University in 1981. Fieldwork was essentially completed in December 1983 and the first major report, on historical resources, was submitted in October 1984.

A cultural resources management plan for the Initial Stage of the Garrison Diversion Unit was drafted in FY 1984. Under the first cultural resources contract, fieldwork on Lonetree Reservoir and Central North Dakota Section was completed, with the report to be completed in FY 1985. A second blanket contract was awarded for investigations in the southern portion of the project area. Work under this contract includes test excavations at sites along the James River, to prepare for National Register nomination and to devise a mitigation plan.

A $370,000 contract for the partial excavation of a proto-Pawnee hunting camp on the Calamus River in central Nebraska was issued in FY 1984. The site is to be inundated by Calamus Reservoir, a feature of the North Loup Project.

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Job Corps

The Bureau of Reclamation has been involved in the Job Corps program since its establishment by the Economic Opportunity Act in 1964.

During FY 1984, 849 male and female corpsmembers were enrolled at Reclamation centers located in Marsing, Idaho; Moses Lake, Washington; Collbran, Colorado; and Ogden, Utah.

The principal objectives of the Job Corps program are to teach disadvantaged youths between the ages of 16 and 21 a vocational trade, improve their education level to enable them to qualify for a General Education Development Certificate, and develop their social skills and values.

Training is acquired in both union and nonunion trades. Training in union trades includes bricklaying, carpentry, cement masonry, heavy equipment operation and repair, painting, tile setting, and plastering. Training in nonunion trades includes medical assistant skills, cooking and baking, welding, automobile mechanics, building and custodial maintenance, warehousing, and clerical skills. When training is completed, corpsmembers are assisted in obtaining jobs within their communities.

Corpsmembers must spend comparable time in vocational training and basic education classes. Education classes include mathematics, reading and writing skills, driver education, physical education, and health and safety. The courses are structured for practical application in vocational skills training and in the workaday world.

Corpsmembers live at civilian conservation centers where the goal is to provide the youths with meaningful and enriching experiences and to encourage them to be useful and productive citizens. Enrollees learn how to relate to each other, develop good work and study habits, pursue hobbies, develop leadership skills, and engage in sports.

The Job Corps not only provides opportunities for personal growth but also produces valuable projects for the Bureau, other Federal and State agencies, local communities, and for the centers themselves. Projects include center maintenance; construction of buildings, roads, recreation facilities; and landscaping. In FY 1984, 2,200 corpsmember-months were expended on construction projects at a direct material cost of $806,500. These projects have an appraised value of $3.1 million.

Corpsmembers from the Columbia Basin Center in Moses Lake, Washington, learn cement masonry and welding skills.

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Reclamation Reform Act of 1982 . . . A New Look for an Old Law

By signing the RRA (Reclamation Reform Act of 1982) on October 12, 1982, President Reagan modernized the 80-year old Reclamation law and opened a new chapter in the history of the West. "While preserving the basic objectives of the original program, this legislation provides a new direction for the federal role in reclamation -- one that will, I believe, prove to be a significant step forward on our road to economic recovery in the 1980's," the President said.

Reclamation Act Of 1902

In 1902, the Reclamation Act established a Reclamation fund by selling public land in the West. With proceeds from these sales, the United States built irrigation works to make water available to land which would have otherwise remained nearly uninhabited. As a condition for receiving irrigation water, landowners agreed to repay their share of project construction costs and to limit the number of acres on which a landowner could receive Reclamation project water. The purpose of the acreage limitation was to:

- Distribute widely the benefits from the Reclamation program
- Provide viable farm opportunities on land receiving Reclamation project water
- Preclude the accrual of speculative gains from a Federal investment

Congress amended the Reclamation Act of 1902 on several occasions; however, the 1902 Act established the basic policies limiting delivery of project water. While Western agriculture grew to meet the demands of the 20th century, the legislation that governed it was tied to the outdated provisions of an 80-year old law. Understandably, controversy and confusion resulted.

The problem culminated in 1976 when a private organization, National Land for People, sued the United States over the manner in which acreage limitation provisions were being administered in central California. As a result of this and other court actions, the Bureau prepared proposed rules and regulations enforcing acreage limitation provisions set forth by the 1902 Act and an environmental impact statement on the effect of these rules. However, these actions were not finalized before Congress initiated reform legislation in early 1982.

Reclamation Reform Act of 1982

On October 12, 1982, the RRA was signed into law, heralding a number of changes for farmers in the West. During the following year, Reclamation developed rules and regulations to provide uniform criteria by which the Act would be implemented. The final rules became effective on January 5, 1984.

The RRA contains two sets of provsions — the discretionary provisions and nondiscretionary provisions. The discretionary provisions apply to only those

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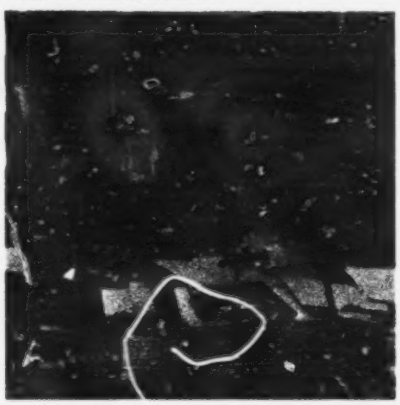
districts with new and amended contracts and to individuals who elect to come under these provisions in the absence of district amendment. The nondiscretionary provisions apply to all irrigation districts subject to Reclamation law.

The original Reclamation Act limited the amount of land an individual could own and irrigate with project water to 160 acres. In later years, this limitation proved inconsistent with prevailing agricultural technology and economics. As a result, many landowners leased large tracts of land in order to achieve an economically sound operation. It soon became apparent that the acreage limitation provisions of the 1902 Act were not accomplishing their objective of preventing delivery of low-cost water to large landholders. The new law helped resolve this problem by increasing the ownership limitations and by charging full-cost water rate for land leased in excess of established thresholds.

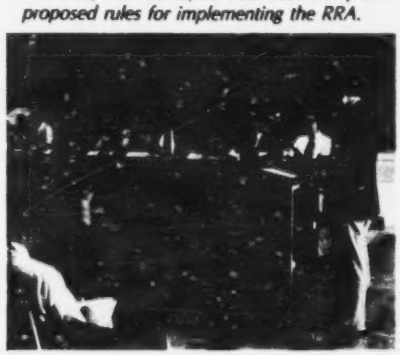
President Reagan signs the Reclamation Reform Act of 1982 into law.



In those districts that become subject to the discretionary provisions, a qualified recipient may increase ownership entitlement from 160 acres to 960 acres. The law defines a qualified recipient as an individual, family, or legal entity benefiting 25 or fewer persons. Under the discretionary provisions, a 640-acre ownership entitlement applies to limited recipients, a legal entity benefiting more than 25 persons. If a landowner is located in a district which does not become subject to the discretionary provisions and if the landowner himself does not elect to come under these provisions, the 160-acre ownership limitation of prior law still applies.

While the original Reclamation Act limited the amount of land which could be owned and irrigated with project water, there was no restriction on the amount of land which could be leased at a low-cost water rate. The RRA also permits unlimited leasing of land in excess of the ownership limits; however, it limits the number of acres which can receive low-cost irrigation water from a Reclamation project. Landholders under the discretionary provisions must pay full cost for land leased in excess of set thresholds — 960 acres in the case of a qualified recipient. Full-cost rates are based on unrepaid project construction costs allocated to irrigation, interest rates, and contract amortization periods.

One of a series of public hearings was held in Willows, California, to hear testimony on proposed rules for implementing the RRA.



The RRA spells out several other new requirements for leasing. All leases for land served by Reclamation projects must now be in writing and leases are limited, in most cases, to a term of 10 years.

Whether subject to the discretionary provisions or prior law, landowners and lessees must now show that they are in compliance with the ownership and leasing requirements by providing their water districts with facts about their farming operations. To meet this requirement, landholders subject to the discretionary provisions must complete certification forms and those subject to prior law must complete reporting forms. On a yearly basis, districts summarize information from the landholders' forms and submit their findings to the Bureau.

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For those districts subject to the discretionary provisions, the RRA provides an opportunity for landowners to expand their ownership limitations beyond those set by law. Upon the request of such districts, the Bureau will make a class 1 equivalency determination. This determination establishes the number of acres of less productive land — classes 2, 3, and 4 — which are needed to be equivalent in productive potential to class 1 land — the most suitable land in the local agricultural economic setting. Once the determination is made, landowners with classes 2, 3, and 4 land will have the right to increase their acreage entitlements until they are equal in productive potential to 960 acres of class 1 land for qualified recipients or 640 acres of class 1 land for limited recipients.

In the past, there was confusion about the residency requirement of the 1902 Act. By that provision, landholders were required to live on or near the land they farmed. However, the status of this requirement became unclear when it was not included in the 1926 Omnibus Adjustment Act. By specifically eliminating all residency requirements, the RRA resolved this issue.

The RRA also resolved the controversy over whether water delivered from the U.S. Army Corps of Engineers projects should be subject to acreage limitation. Except in those cases where Congress has specifically designated a Corps project as part of a Reclamation project and in those cases where the Corps project contains works provided by the Secretary of the Interior, the RRA exempts Corps projects from Reclamation law. The RRA also permits districts in Reclamation projects to become exempt from the acreage limitation and full-cost pricing provisions once they have repaid their construction cost allocation for project facilities.

The Bureau of Reclamation has lead responsibility for implementing these and all other provisions of the RRA — a law which modernizes regulations governing the delivery of irrigation water to the West.

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Status of Funds

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

FY 1984 Status of Funds

	Available Funds*	Obligations	Expenditures
		($ million)	
General Investigations	39.8	35.6	33.2
Construction	730.9	682.4	595.8
Operation and Maintenance	290.2	241.5	241.8
Loan Program	50.7	46.3	42.0
Emergency Funds	4.6	4.2	3.0
General Administrative Expense	53.8	44.9	44.1
Total FY 1984	1,170.0	1,054.9	959.9

* 1984 appropriation plus prior year and other available funds.

Definitions:

An appropriation is legal authorization to incur obligations and make payments for specified purposes.

An obligation is a binding commitment to pay out money for products, services, or other purposes.

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.

The Bureau of Reclamation of the U.S. Department of the Interior is responsible for the development and conservation of the Nation's water resources in the Western United States.

The Bureau's original purpose "to provide for the reclamation of arid and semiarid lands in the West" today covers a wide range of interrelated functions. These include providing municipal and industrial water supplies; hydroelectric power generation; irrigation water for agriculture; water quality improvement; flood control; river navigation; river regulation and control; fish and wildlife enhancement; outdoor recreation; and research on water-related design, construction, materials, atmospheric management, and wind and solar power.

Bureau programs most frequently are the result of close cooperation with the U.S. Congress, other Federal agencies, States, local governments, academic institutions, water-user organizations, and other concerned groups.

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